Notice of Allowability	Application No.	Applicant(s)	
	09/657,871	BRUMITT ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *April 27, 2005*.

2. ☒ The allowed claim(s) is/are *10,17-26 and 29-33*.

3. ☒ The drawings filed on *08 September 2000 and 19 August 2004* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER

RD

DETAILED ACTION

Introduction

1. This communication is in response to the Applicants' communication dated April 27, 2005. Claims 10, 17, 18, 21, 24, 29 and 32 were amended. Claims 1-9, 11-16, 27-28 and 34-51 were canceled. Claims 10, 17-26 and 29-33 of the application are pending.

Drawings

2. The drawings submitted on September 8, 2000 and August 19, 2004 are accepted.

Reasons for Allowance

3. Claims 10, 17-26 and 29-33 of the application are allowed over prior art of record.

4. The following is an Examiner's statement of reasons for the indication of allowable subject matter:

The closest prior art of record shows:

(1) a computer-assisted method and apparatus for feeding animals in a feedlot; a computer network coordinates an animal feedlot operations and management system; the

computer network maintains a database including a model of the feedlot and objects in the feedlot; each feedlot vehicle has an on-board computer system which uses a coordinate acquisition system supported by the GPS; the on-board computer system accesses the database containing a model of the feedlot which reflects the position and orientation of the feedlot vehicle, as it moves through the feedlot; a feedbunk reading vehicle uses its on-board computer to receive, store and display animal health and feed ration dispensed data; the feed delivery vehicle communicates with feedbunk reading vehicle through internet-based communication; the on-board computer system of the feedlot delivery vehicle allows viewing a model of the feedlot, acquiring vehicle position relative to a prescribed coordinate frame and transmitting vehicle information to the network database; the feedlot modeling subsystem maintains a geometrical database containing a geometrical model of the feedlot and objects contained therein; a geometrical database processor uses the coordinate information from the vehicles and feedlot to update the 3-D geometrical model; global and local coordinates reference systems are used with the feedlot; the feedlot delivery vehicles and the feedbunk reading vehicles use local coordinate systems; (**Cureton et al.,** U. S. Patent Application 2002/0116200);

(2) ubiquitous computing using distributed wide area heterogeneous computing technology to provide complex processing and networking capabilities to various objects; using these objects as models, it is possible to control the behavior of the objects by programs running someplace on the network; the behavior processes would communicate with each other using specified protocol; the objects could then react with each other and the users (**Papka et al.,** "UbiWorld: An environment integrating virtual reality, supercomputing and design", IEEE, 1996);

(3) a method of estimating the relationship and error between coordinate frames representing relative locations of objects; the frames may be known indirectly through a series of spatial relationships, each with its associated errors; the method provides a means for estimating the relationships among objects and the uncertainty associated with the relationships (**Smith et al.**, "On representation and estimation of spatial uncertainty", The international journal of Robotics Research, Vol. 5, No. 4, 1986); and

(4) a technique of communicating between computers, computer graphics animation data including a case where motion of a multi-joint object such as a human being or animal is described as time series data; the animation data is composed of a skeletal structure and configuration data of the environment; a plurality of end points of the skeletons are connected by links; to move the skeletal structure object, a local coordinate system for determining the position and orientation of the whole skeletal structure is used; the joint position is specified by the local coordinate system defined for each segment and the position in the whole coordinate system is specified by conversion sequences between the local coordinate systems (**Mochizuki et al.**, U. S. Patent 6,414,684)

4.1 Applicants' first set of claims consists of Claims 17 and 10.

Independent Claim 17 is directed to a computer-implemented process for providing a geometric model database for use in a ubiquitous computing environment. The claim identifies the uniquely distinct features of:

"characterizing the location of each entity in the environment in terms of the coordinate frame of at least one other entity, rather than in terms of a coordinate frame common to all

entities, using a measurement defining the entity's relationship to at least one of said other entities, wherein said measurement comprises the position and orientation of each other entity's coordinate frame origin in terms of the coordinate frame of the entity under consideration, and a spatial uncertainty estimate which is indicative of the accuracy of the method used to obtain the measurement, and wherein each measurement is provided to the geometric model database by an external source, and more than one measurement defining an entity's relationship to another entity may be provided by separate external sources, and wherein the process action of characterizing the location of each entity in the environment relative to other entities using a measurement further comprises an action of, whenever more than one measurement defining an entity's relationship to another entity is received, combining the measurements using their relative uncertainties as weights".

Because the closest prior art fails to teach or fairly suggest characterizing the location of each entity in the environment in terms of the coordinate frame of at least one other entity, rather than in terms of a coordinate frame common to all entities, using a measurement defining the entity's relationship to at least one of said other entities, wherein said measurement comprises the position and orientation of each other entity's coordinate frame origin in terms of the coordinate frame of the entity under consideration, and a spatial uncertainty estimate which is indicative of the accuracy of the method used to obtain the measurement, and wherein each measurement is provided to the geometric model database by an external source, and more than one measurement defining an entity's relationship to another entity may be provided by separate external sources, and wherein the process action of characterizing the location of each entity in

the environment relative to other entities using a measurement further comprises an action of, whenever more than one measurement defining an entity's relationship to another entity is received, combining the measurements using their relative uncertainties as weights, as claimed by the Applicants, Claims 17 and 10 are deemed novel and allowable.

4.2 Applicants' second set of claims consists of Claims 18-20.

Independent Claim 18 is directed to a computer-implemented process for providing a geometric model database for use in a ubiquitous computing environment. The claim identifies the uniquely distinct features of:

"identifying cycles of measurements among the measurements, wherein a cycle of measurements is defined as a string of measurements starting at the origin of a first entity frame in the cycle and following measurements from one entity to the next until reaching a last measurement in the cycle representing the relationship between the coordinate frame of a next to last entity of the cycle and the origin of the first entity frame" and "computing revised measurements for the identified cycles by simultaneously adjusting the measurements based on their associated uncertainty estimates so as to make the given location of the first entity frame's origin in each of the identified cycles match the location of that origin as indicated by following the chain of measurements making up the cycle".

Because the closest prior art fails to teach or fairly suggest identifying cycles of measurements among the measurements, wherein a cycle of measurements is defined as a string of measurements starting at the origin of a first entity frame in the cycle and following

measurements from one entity to the next until reaching a last measurement in the cycle representing the relationship between the coordinate frame of a next to last entity of the cycle and the origin of the first entity frame; and computing revised measurements for the identified cycles by simultaneously adjusting the measurements based on their associated uncertainty estimates so as to make the given location of the first entity frame's origin in each of the identified cycles match the location of that origin as indicated by following the chain of measurements making up the cycle, as claimed by the Applicants, Claims 18-20 are deemed novel and allowable.

4.3 Applicants' third set of claims consists of Claims 21-23.

Independent Claim 21 is directed to a computer-implemented process for providing a geometric model database for use in a ubiquitous computing environment. The claim identifies the uniquely distinct features of:

"identifying cycles of measurements among the measurements, wherein a cycle of measurements is defined as a string of measurements starting at the origin of a first entity frame in the cycle and following measurements from one entity to the next until reaching a last measurement in the cycle representing the relationship between the coordinate frame of a next to last entity of the cycle and the origin of the first entity frame", "computing the location of the first entity frame's origin as indicated by following the chain of measurements making up the cycle, along with computing an uncertainty region around the computed location of the origin based on a combination of the uncertainty estimates associated with each measurement in the cycle", and "whenever the given location falls outside the uncertainty region, declaring that at

least one of the measurements in the cycle is incorrect, and whenever it is declared that one of the measurements in the cycle is incorrect, disregarding these measurements and requesting that replacement measurements be provided".

Because the closest prior art fails to teach or fairly suggest identifying cycles of measurements among the measurements, wherein a cycle of measurements is defined as a string of measurements starting at the origin of a first entity frame in the cycle and following measurements from one entity to the next until reaching a last measurement in the cycle representing the relationship between the coordinate frame of a next to last entity of the cycle and the origin of the first entity frame", "computing the location of the first entity frame's origin as indicated by following the chain of measurements making up the cycle, along with computing an uncertainty region around the computed location of the origin based on a combination of the uncertainty estimates associated with each measurement in the cycle", and "whenever the given location falls outside the uncertainty region, declaring that at least one of the measurements in the cycle is incorrect, and whenever it is declared that one of the measurements in the cycle is incorrect, disregarding these measurements and requesting that replacement measurements be provided, as claimed by the Applicants, Claims 21-23 are deemed novel and allowable.

4.4 Applicants' fourth set of claims consists of Claims 24-26.

Independent Claim 24 is directed to a computer-implemented process for providing a geometric model database for use in a ubiquitous computing environment. The claim identifies the uniquely distinct features of:

"identifying cycles of measurements among the measurements, wherein a cycle of measurements is defined as a string of measurements starting at the origin of a first entity frame in the cycle and following measurements from one entity to the next until reaching a last measurement in the cycle representing the relationship between the coordinate frame of a next to last entity of the cycle and the origin of the first entity frame", "computing the location of the first entity frame's origin as indicated by following the chain of measurements making up the cycle, along with computing an uncertainty region around the computed location of the origin based on a combination of the uncertainty estimates associated with each measurement in the cycle", "whenever the given location falls outside the uncertainty region, declaring that at least one of the measurements in the cycle is incorrect, and whenever it is declared that one of the measurements in the cycle is incorrect, disregarding these measurements and requesting that replacement measurements be provided", and "computing revised measurements for those identified cycles in which the given location of the origin is not the same as its computed location but in which the given location falls within the uncertainty region by simultaneously adjusting the measurements based on their associated uncertainty estimates so as to make the given location of the first entity frame's origin in each of the identified cycles match the location of that origin as indicated by following the chain of measurements making up the cycle".

Because the closest prior art fails to teach or fairly suggest identifying cycles of measurements among the measurements, wherein a cycle of measurements is defined as a string of measurements starting at the origin of a first entity frame in the cycle and following measurements from one entity to the next until reaching a last measurement in the cycle

representing the relationship between the coordinate frame of a next to last entity of the cycle and the origin of the first entity frame", "computing the location of the first entity frame's origin as indicated by following the chain of measurements making up the cycle, along with computing an uncertainty region around the computed location of the origin based on a combination of the uncertainty estimates associated with each measurement in the cycle", "whenever the given location falls outside the uncertainty region, declaring that at least one of the measurements in the cycle is incorrect, and whenever it is declared that one of the measurements in the cycle is incorrect, disregarding these measurements and requesting that replacement measurements be provided and computing revised measurements for those identified cycles in which the given location of the origin is not the same as its computed location but in which the given location falls within the uncertainty region by simultaneously adjusting the measurements based on their associated uncertainty estimates so as to make the given location of the first entity frame's origin in each of the identified cycles match the location of that origin as indicated by following the chain of measurements making up the cycle, as claimed by the Applicants, Claims 24-26 are deemed novel and allowable.

4.5 Applicants' fifth set of claims consists of Claims 29-31.

Independent Claim 29 is directed to a computer-implemented process for providing a geometric model database for use in a ubiquitous computing environment. The claim identifies the uniquely distinct features of:

"whenever the direct measurement does not exist, employing a breadth-first search to find a measurement path between the two entities involved in the request that has the fewest

number of measurement links, wherein a measurement path is a chain of measurements from a first of the two entities involved in the request, through at least one intermediate entity, to the other entity involved in the request" and "computing the requested measurement information using the measurements in the measurement path, if one was found".

Because the closest prior art fails to teach or fairly suggest whenever the direct measurement does not exist, employing a breadth-first search to find a measurement path between the two entities involved in the request that has the fewest number of measurement links, wherein a measurement path is a chain of measurements from a first of the two entities involved in the request, through at least one intermediate entity, to the other entity involved in the request and computing the requested measurement information using the measurements in the measurement path, if one was found, as claimed by the Applicants, Claims 29-31 are deemed novel and allowable.

4.6 Applicants' sixth set of claims consists of Claims 32-33.

Independent Claim 32 is directed to a computer-implemented process for providing a geometric model database for use in a ubiquitous computing environment. The claim identifies the uniquely distinct features of:

"transforming the coordinates of the extents associated with the other entities into the coordinate frame of the specified entity using the respective relative geometric relationships between the frame origin of the specified entity and the frame origins of the other entities", "employing a region intersection procedure to determine if the extents associated with the other

entities intersect the prescribed region or extent associated with the specified entity" and "providing information to the requesting source as to whether the extents of any of the other entities intersect the prescribed region or extent of the specified entity, and if so which of the other entities' extents intersect".

Because the closest prior art fails to teach or fairly suggest transforming the coordinates of the extents associated with the other entities into the coordinate frame of the specified entity using the respective relative geometric relationships between the frame origin of the specified entity and the frame origins of the other entities, employing a region intersection procedure to determine if the extents associated with the other entities intersect the prescribed region or extent associated with the specified entity; and providing information to the requesting source as to whether the extents of any of the other entities intersect the prescribed region or extent of the specified entity, and if so which of the other entities' extents intersect, as claimed by the Applicants, Claims 32-33 are deemed novel and allowable.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is

571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

K. Thangavelu
Art Unit 2123
May 17, 2005

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER